

Exhibit 33



US009294757B1

(12) **United States Patent**
Lewis et al.

(10) **Patent No.:** **US 9,294,757 B1**
(45) **Date of Patent:** **Mar. 22, 2016**

(54) **3-DIMENSIONAL VIDEOS OF OBJECTS**

(71) Applicant: **Google Inc.**, Mountain View, CA (US)

(72) Inventors: **Thor Lewis**, San Francisco, CA (US);
Alley Rutzel, Santa Clara, CA (US)

(73) Assignee: **GOOGLE INC.**, Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/835,887**

(22) Filed: **Mar. 15, 2013**

(51) **Int. Cl.**

H04N 13/02 (2006.01)

H04N 5/262 (2006.01)

H04N 5/77 (2006.01)

G06F 3/038 (2013.01)

(52) **U.S. Cl.**

CPC **H04N 13/0242** (2013.01); **G06F 3/038** (2013.01); **H04N 5/2628** (2013.01); **H04N 5/772** (2013.01)

(58) **Field of Classification Search**

CPC G06T 19/00

USPC 345/419

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,084,979 A * 7/2000 Kanade et al. 382/154
6,154,251 A 11/2000 Taylor
6,535,226 B1 3/2003 Sorokin et al.
6,741,250 B1 * 5/2004 Furlan G06T 19/003
345/427
6,791,542 B2 9/2004 Matusik et al.
6,983,064 B2 1/2006 Song
7,035,453 B2 * 4/2006 Liu 382/154
7,106,361 B2 * 9/2006 Kanade et al. 348/159

7,583,815 B2 * 9/2009 Zhang et al. 382/103
7,595,816 B1 * 9/2009 Enright et al. 348/150
7,640,515 B2 * 12/2009 Balakrishnan G06F 3/038
715/848
7,884,848 B2 2/2011 Ginther
8,060,908 B2 11/2011 Bountour et al.
8,125,481 B2 * 2/2012 Gossweiler, III G06T 19/00
345/419
8,155,186 B2 * 4/2012 Murakami H04N 19/597
375/240.12
8,204,299 B2 6/2012 Arcas et al.
8,223,192 B2 * 7/2012 Gotsman H04N 5/2628
348/36
8,270,704 B2 9/2012 Kim et al.
8,462,198 B2 * 6/2013 Lin et al. 348/43
8,812,990 B2 * 8/2014 Reponen G06F 3/0346
715/848
2004/0104935 A1 * 6/2004 Williamson et al. 345/757
2005/0088515 A1 4/2005 Geng
2011/0050929 A1 3/2011 Lee et al.
2013/0135315 A1 * 5/2013 Bares et al. 345/473
2013/0278727 A1 10/2013 Tamier et al.

FOREIGN PATENT DOCUMENTS

WO WO 0058913 10/2000

OTHER PUBLICATIONS

Google patent search.pdf (online search). *
(Continued)

Primary Examiner — William C Vaughn, Jr.

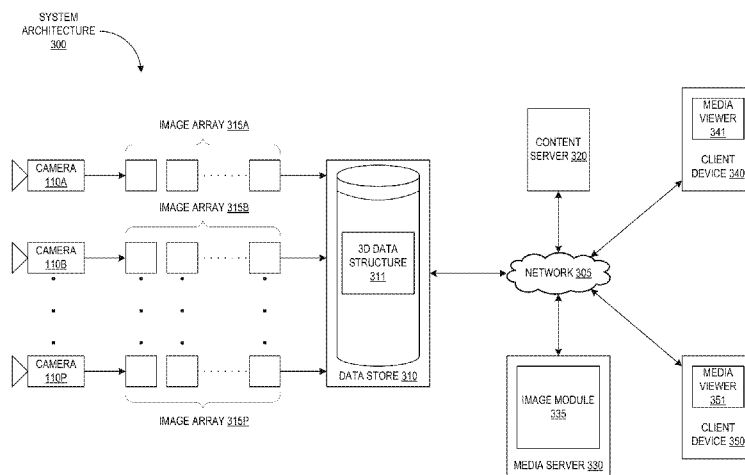
Assistant Examiner — Luis Perez Fuentes

(74) *Attorney, Agent, or Firm* — Lowenstein Sandler LLP

(57) **ABSTRACT**

A plurality of cameras capture images of an object from different viewpoints. The images from each of the cameras are used to generate a 3D video of the object. The 3D video is provided to a user for viewing the object. The user may switching between different viewpoints of the 3D video while viewing the 3D video. A media viewer may be provided to a user and the media viewer may allow the user to specify different viewpoints and to control playback of the 3D video.

20 Claims, 9 Drawing Sheets



US 9,294,757 B1

Page 2

(56)

References Cited

OTHER PUBLICATIONS

Wilburn, et al., "High Performance Imaging Using Large Camera Arrays", ACM Transactions on Graphics 24.3 (2005): 765-776. (Retrieved on Nov. 14, 2012 from: http://graphics.stanford.edu/papers/CameraArray/CameraArray_Sig05.pdf).
David Shaman, "SceneNet turns mobile video clips into (almost) live, 3D events," SceneNet, May 12, 2014.

Puneet Jain et al., "Focus: Clustering Crowdsourced Videos by Line-of-Sight," SenSys '13, Nov. 11-15, 2013.

Guanfeng Wang et al., "Active key frame selection for 3D model reconstruction from crowdsourced geo-tagged videos," 15th IEEE International Conference on Multimedia & Expo (ICME 2014), 2014.

* cited by examiner